FETC SUCCESS
U.S. Department of Energy
Federal Energy Technology Center

CLEAN AFFORDABLE POWER

- [x] fossil energy
- [ ] environmental
- [x] energy efficiency
- [ ] other

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Applying Tomorrow's Technology to Today's Gas Turbines

States Impacted:
California, Florida, Georgia, New York, North Carolina, Oklahoma, South Carolina, Texas, and New England states

Benefit Areas:
Reduced Energy Costs, Reduced CO_2 and NO_X Emissions, Ultra-Efficient Power Production, Environment, Energy Security

Participants:
General Electric Company, Siemens-Westinghouse Power Corporation, United Technology Research Center, Solar Turbines, Allison Engine Company, the South Carolina Institute for Energy Studies, Howmet, PCC Airfoils, Parker Hannifan, Alzeta Corporation, and Oak Ridge National Laboratory

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Description

The combined-cycle power plant is the technology of choice for generating electricity today, and the gas turbine is the primary component. U.S. turbine manufacturers have dominated the market for gas turbines worldwide, but foreign technology has recently dominated technological advancements. DOE initiated a program in 1992, in cooperation with major turbine manufacturers and a university consortium, to develop a “quantum leap” gas turbine. The result is an advanced gas turbine that is vastly superior to any gas turbine developed to date.

The General Electric Company (GE) and Siemens-Westinghouse Power Corporation are developing large (greater than 400 megawatts) gas-turbine combined-cycle systems that improve system efficiency and maintain lower environmental emissions. A university-industry consortium is advancing land-based gas turbine systems and improving power generation capabilities. The GE and Siemens-Westinghouse systems can reduce electricity costs by 10 percent while reducing NO_X emissions by 65 percent and CO_2 emissions by 8 percent over current gas-turbine combined-cycle technologies.

Goals

The goal is to produce a new advanced class of commercial and economical gas turbines that save fuel, reduce electricity costs and NO_X and CO_2 emissions, and improve system efficiency.

Tangible Benefits

National: Up to 342 gigawatts (GW) of new power generation capacity in the U.S. will be supplied by simple-cycle and combined-cycle gas turbine systems from 1996 to 2020. Gas turbines have become the dominant power generation technology in the U.S. Since 1990, 60 percent of all electric generation capacity additions in the U.S. have been natural-gas-fueled. From 1993 to 1995, more than 250 new gas turbines were ordered for power generation service in North America.

ATS technology is projected to provide up to 50 percent of all new combined-cycle installations in the global marketplace by the year 2005. This will result in significant fuel savings and reductions in CO_2 and NO_X emissions. ATS systems will be substantially manufactured in the U.S., sustaining jobs and industry strength for the U.S. economy.

Regional: A total of 107 GW in gas-fired capacity additions have been announced for the U.S. to the year 2011: many North American Electric Reliability Council Regions of the U.S. have announced gas-fired capacity additions of over 5 GW. These regions are the East Central Area Reliability Coordination Agreement, the Electric Reliability Council of Texas, Mid-Atlantic Power Coordination Council, Mid-American Interpool Network, Northeast Power Coordinating Council, Southeastern Electric Reliability Council, Western Systems Coordinating Council, and the Southwest Power Tool.

Local: Advanced gas turbine technology will provide an environmentally preferred, low cost, and efficient gas-fired generation option.

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